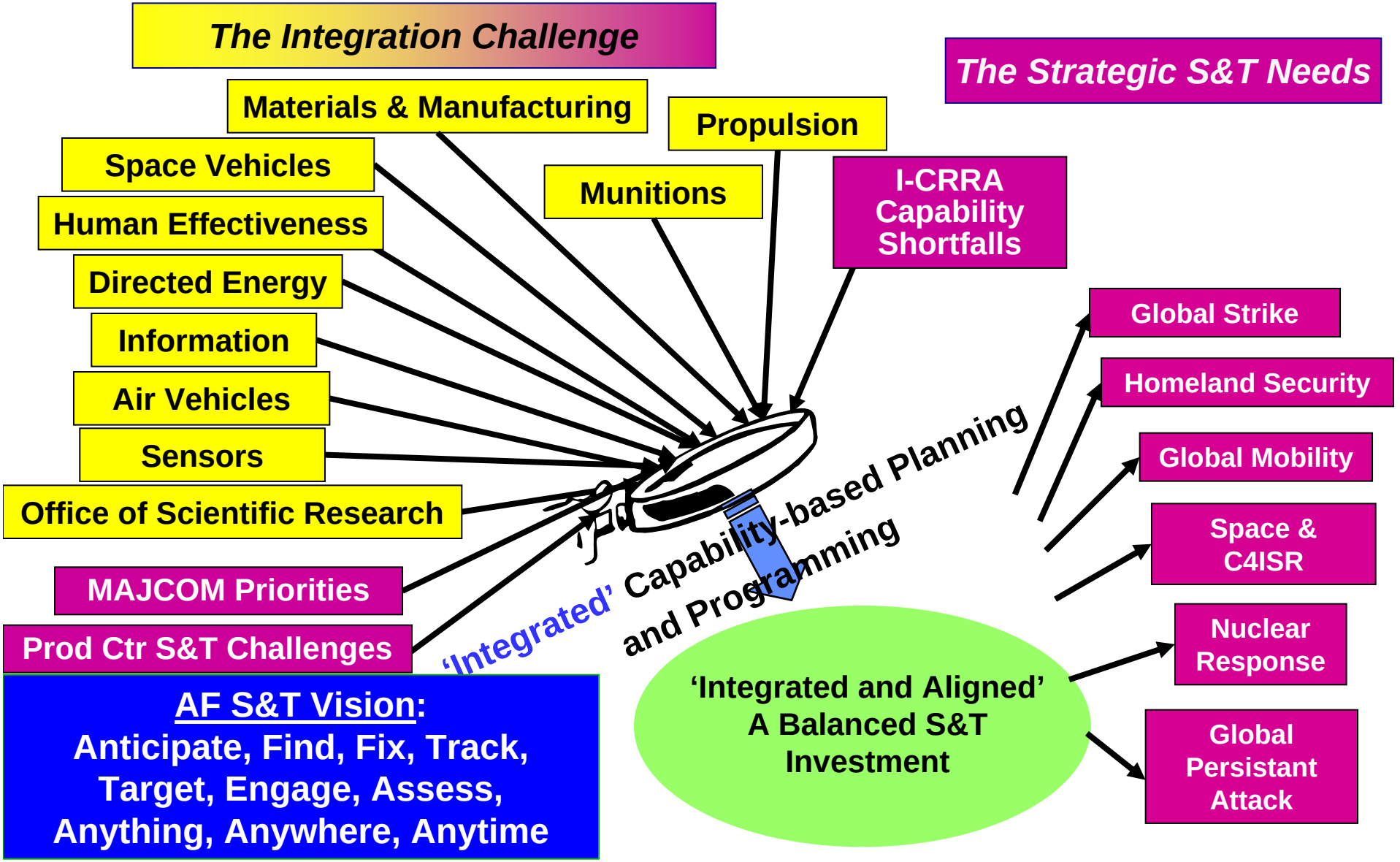
Focused Long Term Challenges (FLTCs)

18 Mar 08

Leo J Rose
Chief, FLTC #3

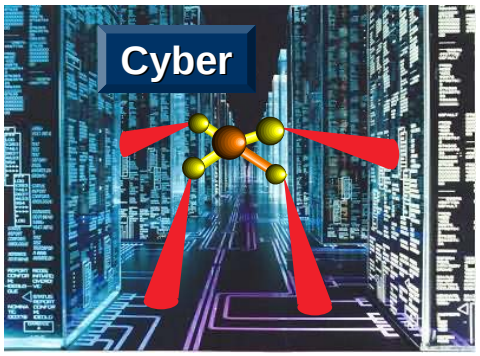
AFRL
THE AIR FORCE RESEARCH LABORATORY
LEAD | DISCOVER | DEVELOP | DELIVER

S&T Integrated Investment Development is a Challenge!



Air Force S&T Vision

Integrated Across Domains



AF S&T is focused on elimination of the "gaps"

Looking at Today's Needs and Beyond

SECAF, Chief – long view, strategic planning

PM, Industry/Product Center – next generation, acquisition timelines

Warfighter – day-to-day, employing capabilities

2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021

rapidly deliver technical innovation, driven by warfighter emergencies –*reshape today's battles*

Rapid Reaction

develop technology options that meet the needs of capability developers – *shape today's Air Force*

ATDs

conduct long-term research, driven by a bold technology goal – *shape the future Air Force*

Focused Long Term Challenges & Basic Research

Evolution of How America Fights

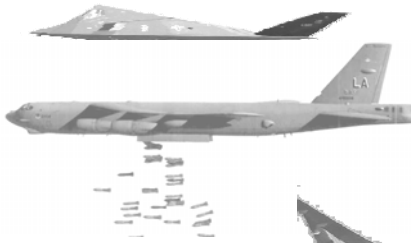
WWII
Maneuver Warfare on Land
Strategic Bombing by Air

The Enemy

Large Armies, Navies, & Air Forces
Indigenous Industrial Capacity

Vietnam
Air Assault Operations with Heavy Interdiction & CAS

Guerrilla Tactics, Jungle Cover
External Supply, Little Industry



DESERT STORM
Precision Engagement ("Kick the Door Down") Followed by Preparing the Battlefield

Conventional Forces
Command & Control Net
Open Desert Conditions

Global War on Terror
Interdependent Fight

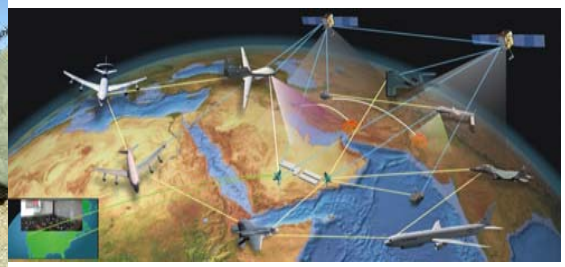
Insurgents / Terrorists
No Borders / Non-State
Autonomous Operations
Adaptive & Low Tech

How we fight is driven by who we fight

Distribution A: Approved for public release; distribution unlimited

Today's Fight: Interdependent

Rapid massing of prediction, detection, and communication resources to deliver concentrated precision strike in time to achieve desired effects



- Evolutionary step in Joint warfare
- "Spherical" situational awareness
  - Real-time and predictive
  - Cut kill cycle to minutes and seconds
  - Get instant feedback to all on the net
- Interconnectivity across air, space, ground, sea, and cyberspace
- Able to bring fire close to friendlies
- Critical enablers: persistent C2ISR, data fusion for common operating picture, delivery of rapid/precise fires

Technical Challenges

- **Persistent tactical ISR**
  - **Day/night, adverse weather, real-time/retrievable data, counter-concealment, wide field of view (constant stare)**
- **Data fusion into common operating picture**
  - **Integrate data from multiple sources, Services, agencies**
  - **Allow display tailorability appropriate to needs of users**
- **Rapid, precise, tailorable strike**
  - **Respond in minutes and seconds, not hours**
  - **Keep friendlies & non-combatants out of harm's way**

How do we address these challenges?

What About Tomorrow's Fight?

Future

Long

Term

Challenges

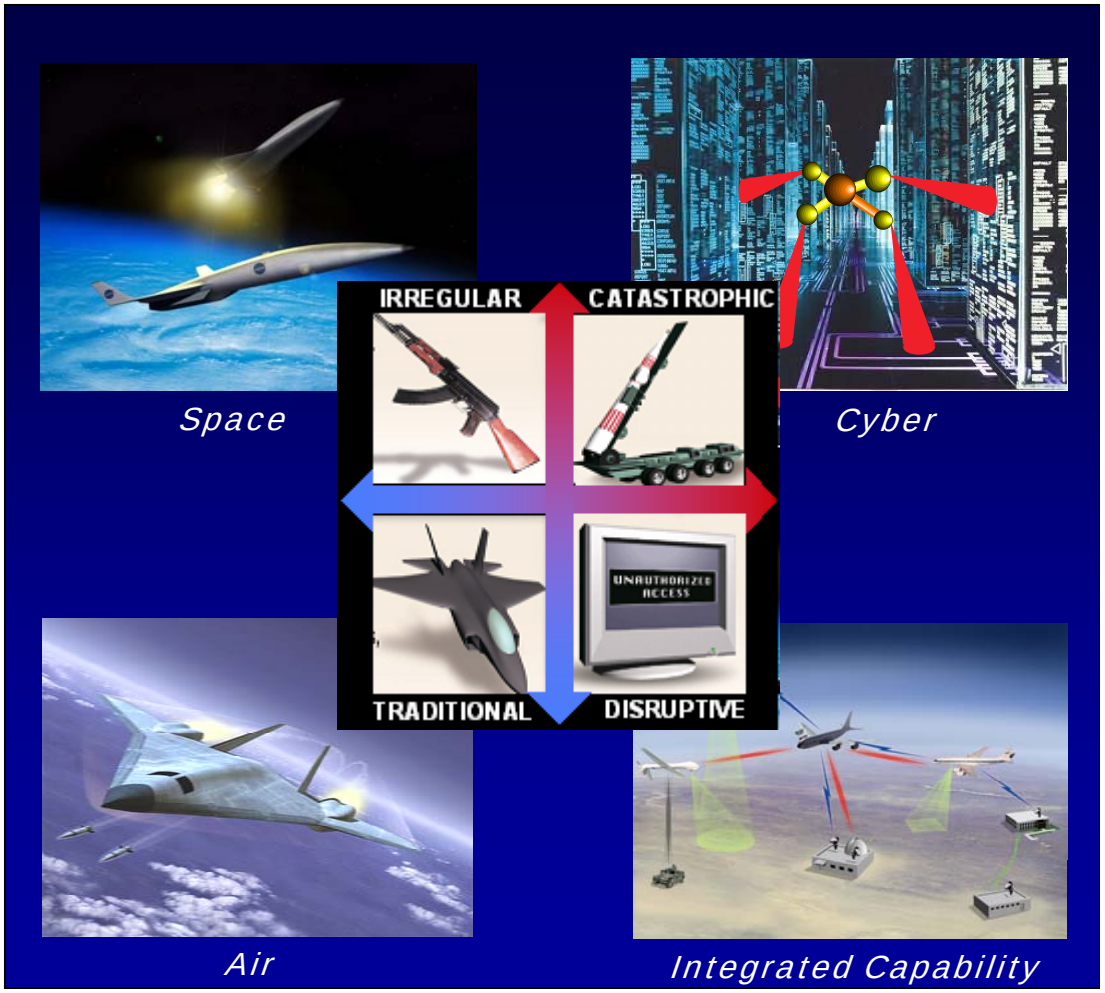
Delivering tomorrow's capabilities through leadership, discovery, innovation, and integration

Focused Long Term Challenges

Focused Long Term Challenges

Delivering the Air Force S&T Vision Through Leadership, Discovery, Innovation, and Integration.

1. **Anticipatory Command, Control & Intelligence (C2I)**
2. **Unprecedented Proactive Intelligence, Surveillance & Reconnaissance (ISR)**
3. **Dominant Difficult Surface Target Engagement/Defeat**
4. **Persistent & Responsive Precision Engagement**
5. **Assured Operations in High Threat Environments**
6. **Dominant Offensive Cyber Engagement**
7. **On-demand Force Projection, Anywhere**
8. **Affordable Mission Generation & Sustainment**



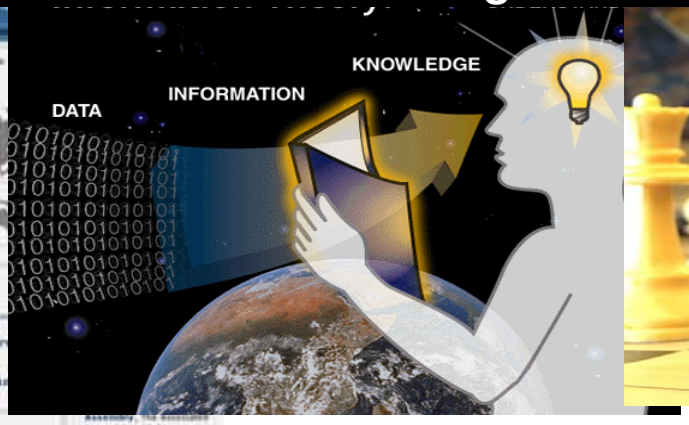
FLTC #1 Anticipatory Command, Control & Intelligence (C2I)

Create a Shared Battlespace Awareness, Anticipate Enemy Actions and Respond with Synchronized Management of Battlespace Effects

- Discover Threatening Systems & Objects
- Predict Adversary Behaviors
- Perform Near-Real Time Decision Management
- Assure Fully Effective C2I Operators

Building

Understanding

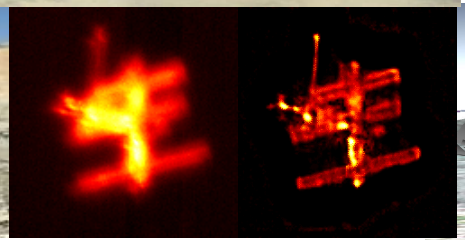


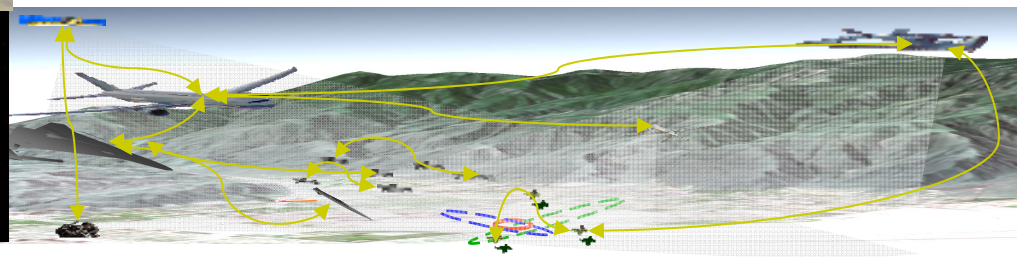
Strategizing

FLTC #2 Unprecedented Proactive Intelligence, Surveillance & Reconnaissance (ISR)

Proactively Find, Fix, and Track Anything, Anytime, Anywhere with Agile and Immediate ISR

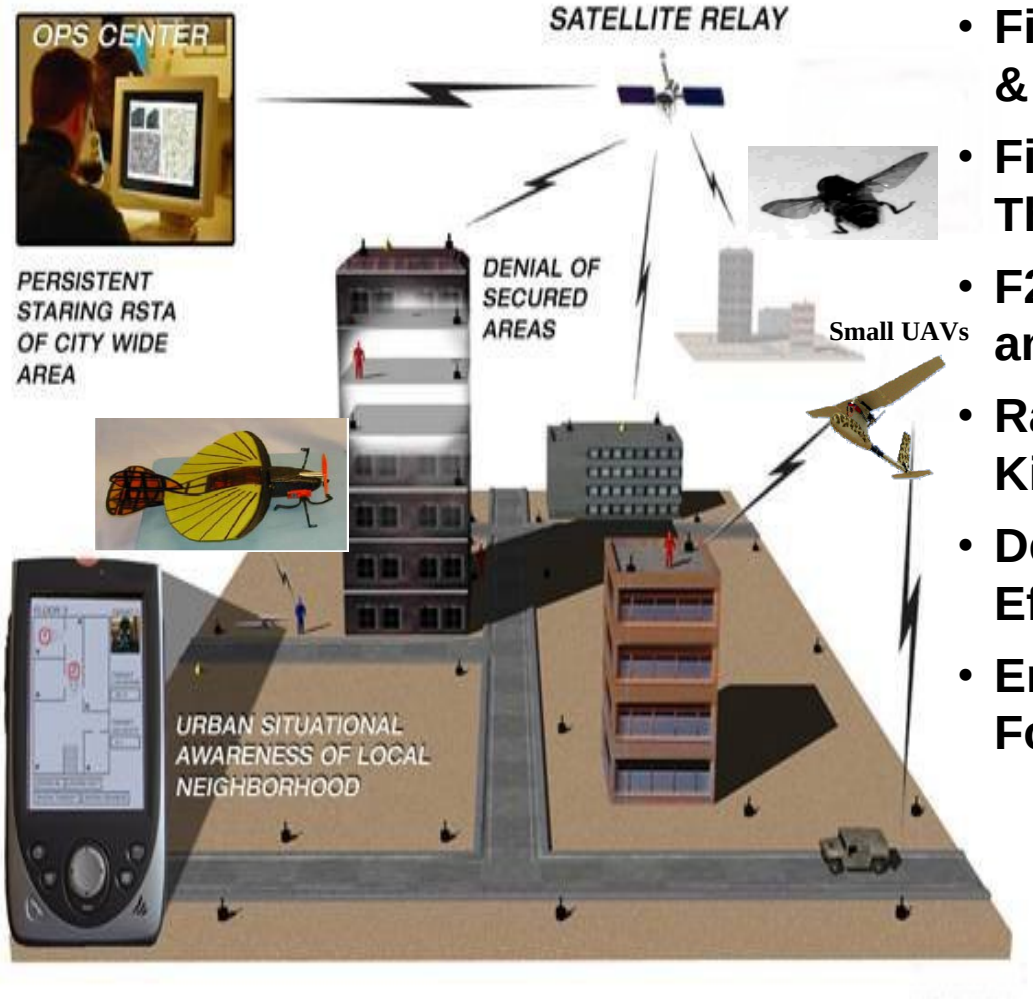
- Enable High Performance Networks for Assured C2 and Sensing
- Deliver On-Demand Fused Multi-Source ISR for Total Battlespace Awareness
- Assure Closed-Loop C2ISR Sensing and Processing (anticipatory)
- Generate Wide-Area, Global Access, Detection and Tracking
- Generate High-Volume, Super Resolution Imagery of Anywhere, Anytime
- Provide Comprehensive Space Situational Awareness



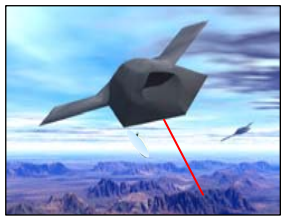


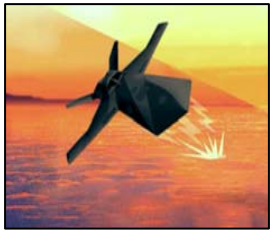
FLTC #3 Dominant Difficult Surface Target Engagement/Defeat

Detect, Identify, Tag, Track, Target Adversaries, IEDs, CBRNE in Congested or Concealed Environments and Create Desired Effects



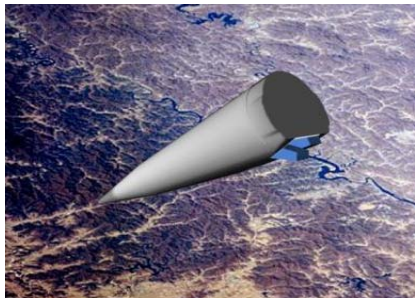
- Find, ID, Track and Engage Adversaries & IEDs
- Find, ID, Engage and Neutralize CBRNE Threats
- F2T2 Difficult Targets In Complex Urban and Difficult Terrains
- Rapidly Deliver Scalable Kinetic & Non-Kinetic Effects to Difficult Targets
- Deliver On-Demand, Precise Lethal Effects to Difficult Targets
- Engage Adversaries with Non-Lethal Force

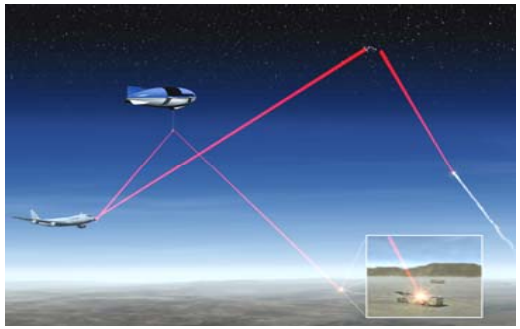




FLTC #4 Persistent & Responsive Precision Engagement

Maneuver Through Anti-Access/Area Denied Environments to Deliver Effects Rapidly and/or Persistently



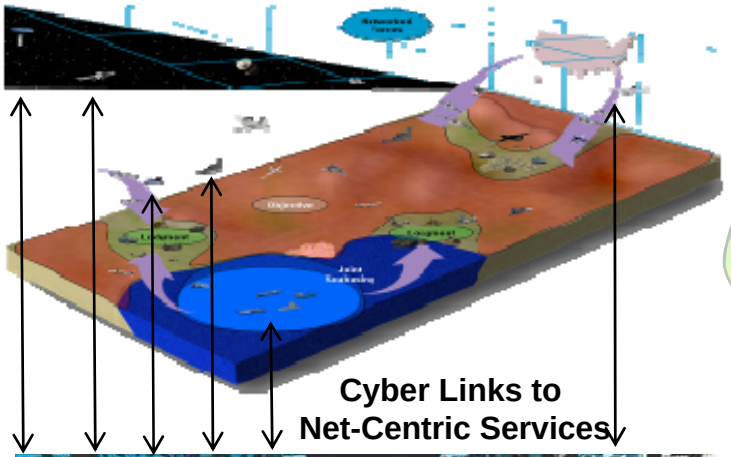


- **Globally Deliver Directed Energy and Other Non-kinetic Effects**
- **Globally Deliver Full Spectrum of Kinetic Effects**
- **Globally Deliver Selected Effects for Time-Sensitive Targets**
- **Clandestinely Deliver Autonomous, Unattended Payloads - Globally**

FLTC #5 Assured Operations in High Threat Environments

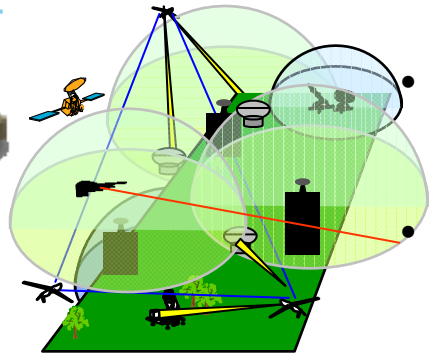
Achieve Mission Objectives With Impunity Against Full Spectrum Threats, from Anti-Access IADS to Cyber

Assured operations in aerospace

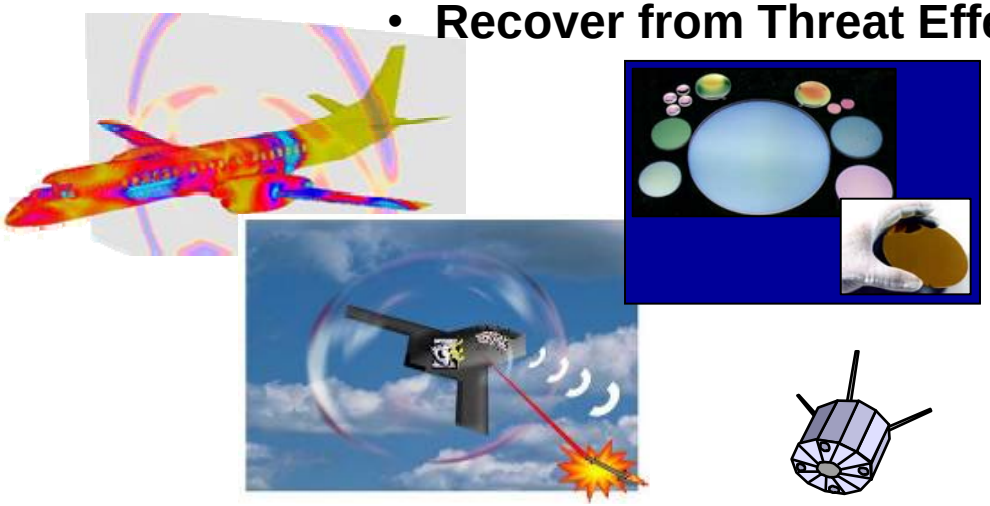


Cyber Links to Net-Centric Services

Protection in the cyber domain



- Anticipate Threats and Avoid Through Stealth and Deception
- Detect and Defeat Threats Through Defenses
- Survive the Attack Through Passive and Adaptive Protection
- Recover from Threat Effects

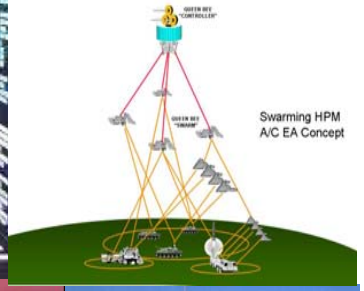


FLTC #6 Dominant Offensive Cyber Engagement

Conduct Full Spectrum Offensive Cyber/Information Operations against Military, Leadership, and Infrastructure





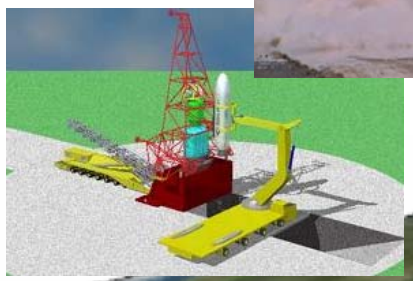




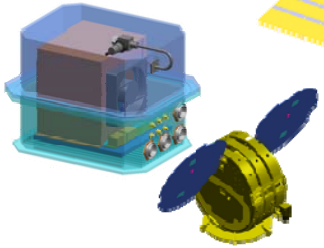
- Access Adversary's Cyber/Information Systems Anywhere, Anytime
- Operate with Stealth and Persistence in Cyber
- Generate Robust Cyber Intelligence (CYBINT)
- Deliver Integrated D5 Information Operations Effects
- Deliver Effects Against Electronic Systems

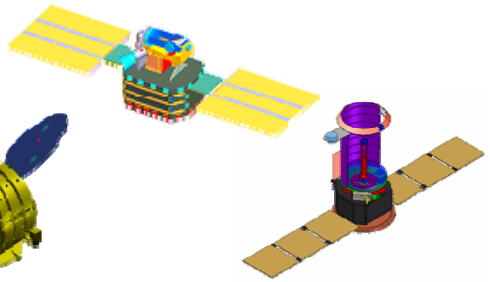
FLTC #7 On-demand Force Projection, Anywhere

Timely Deployment of Flexible Ground, Information & Space Capabilities for the Commander



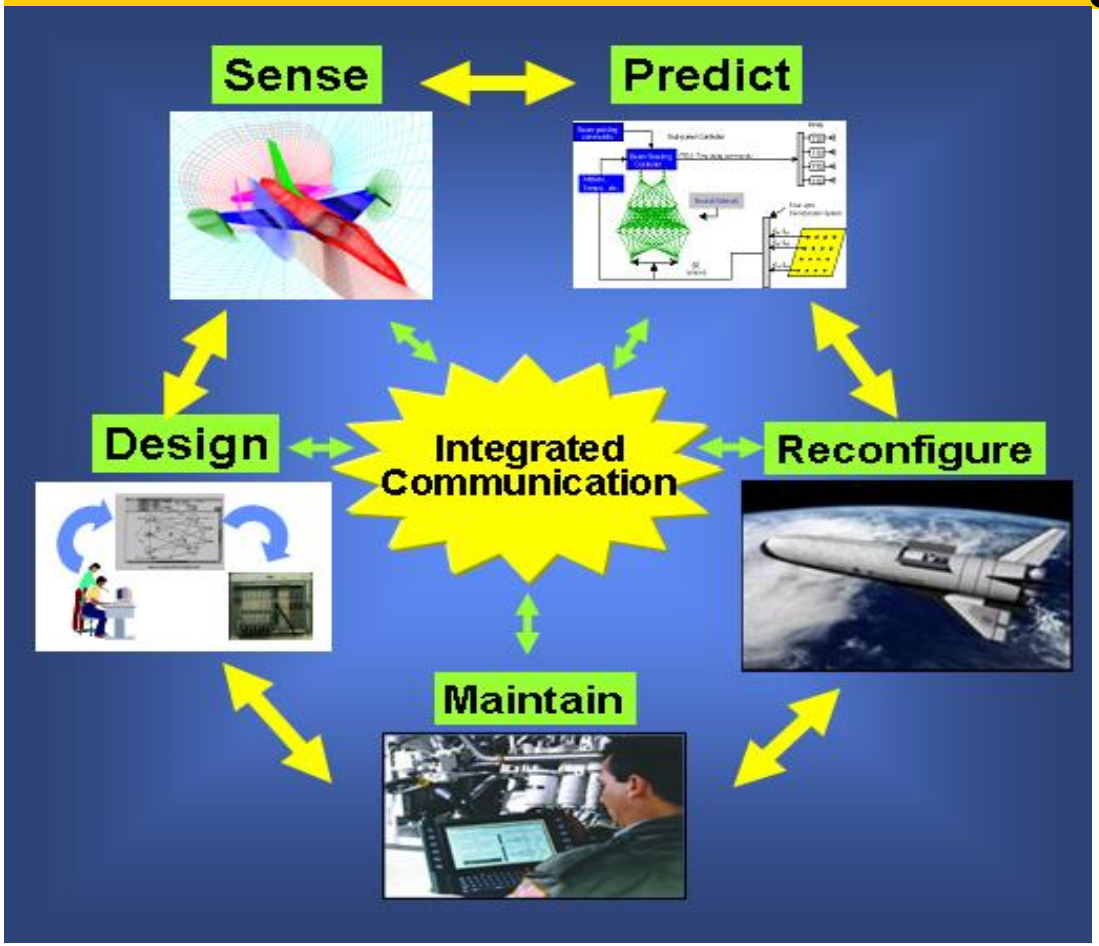
- Rapidly Constitute Multi-Mission, Affordable Satellites
- Rapidly Deploy Multi-Mission, Affordable Space Payloads
- Generate On-Demand, Reusable and Affordable Space Access
- Rapidly Checkout Spacecraft and Autonomous Operations
- Globally Project Ground Forces and Materiel Anywhere in Any Weather
- Globally Move, Manage, And Process Information In Real-time





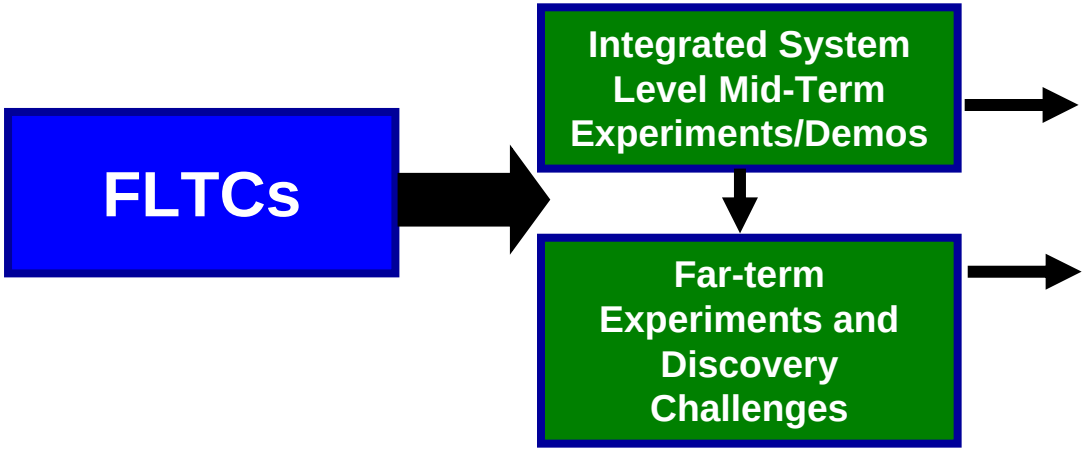
FLTC #8: Affordable Mission Generation & Sustainment

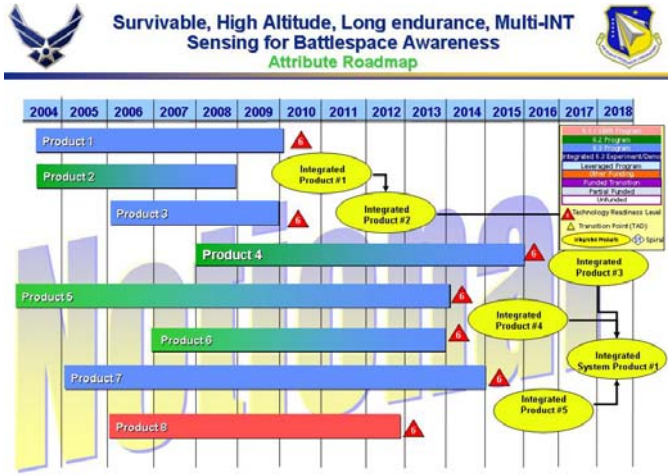
Maximize Mission Capability, Readiness, Reliability and Maintainability of Current and Future Fleets While Minimizing Costs



- Provide Real-time Total System Health Status
- Predict Any System's Mission Capability
- Autonomously Reconfigure Systems for Any Damage Condition
- Proactively Maintain Readiness
- Design for Integrated System Life Cycle Management & Intrinsic Reliability

FLTC Process/Deliverables

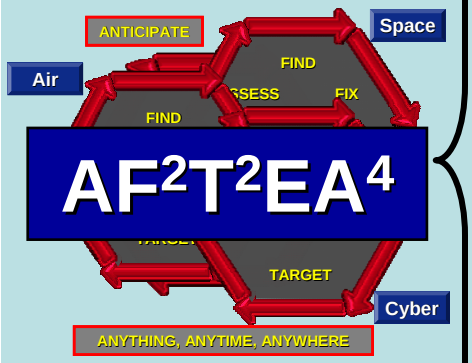




- **Process Deliverables**
  - **FLTC Problem Statement and Technology Challenge Baseline**
  - **Capability taxonomies defined to program level**
  - **Capability evolution expressed as attributes vs. time**
  - **Mid-term capability experiments/demonstrations & product roadmaps**
  - **Capabilities defined using Attribute & Product quad charts**

Will highlight the whole set using FLTC #3

FLTC Taxonomy

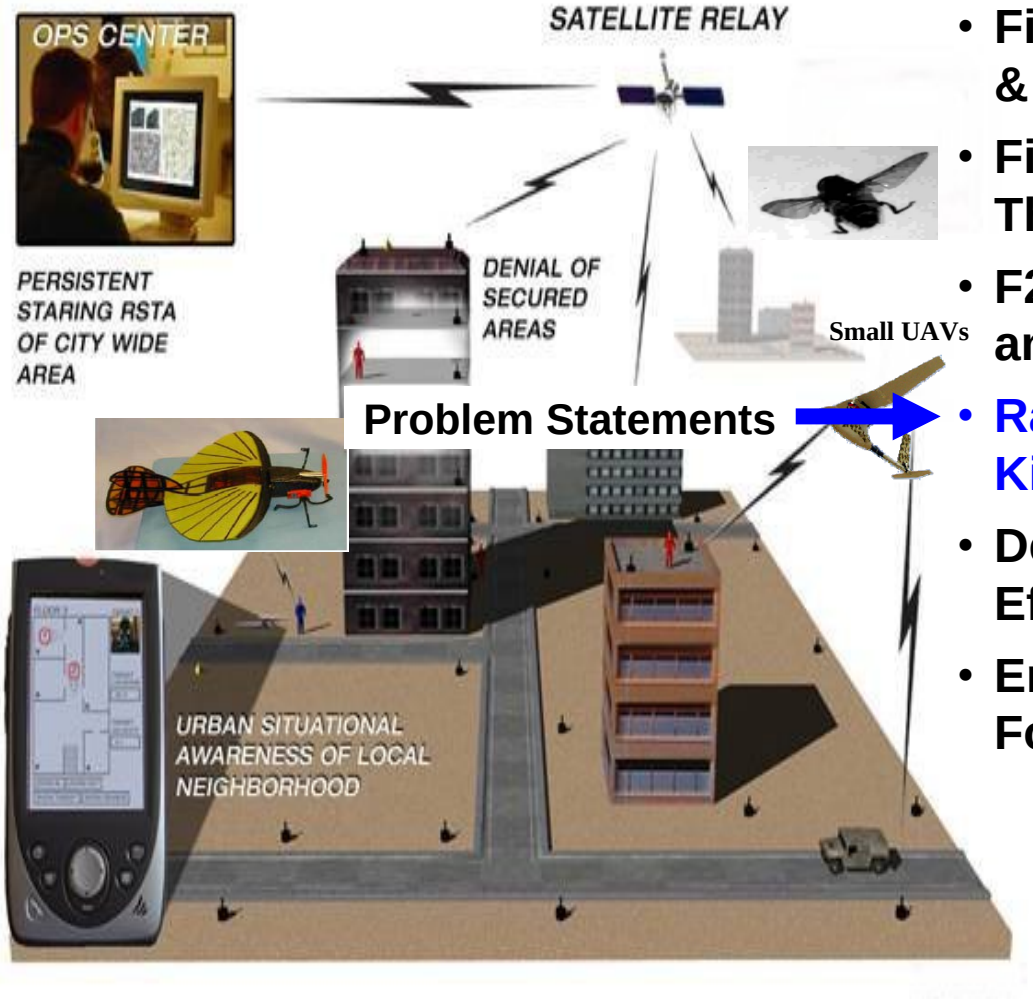


- FLTC 1
  - Problem Statement 1
  - Problem Statement N
  - Mid-Term Attribute 1
    - Product 1
      - Program 1
      - Program K
    - Product L
  - Mid-Term Attribute M
  - Long-term Attribute
    - Product 1
    - Product J
    - Discovery Challenge Thrust(s)
    - Tech Base Watch List
- FLTC 8

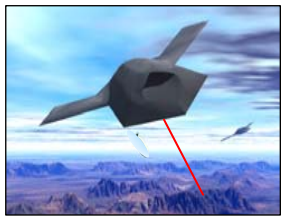
Vision / *Capabilities* / *Problems* / *Tech Challenges* / *Approaches*

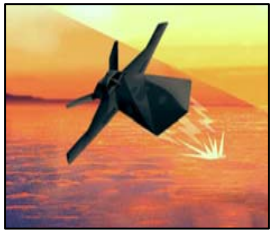
FLTC #3 Dominant Difficult Surface Target Engagement/Defeat

Detect, Identify, Tag, Track, Target Adversaries, IEDs, CBRNE in Congested or Concealed Environments and Create Desired Effects



- Find, ID, Track and Engage Adversaries & IEDs
- Find, ID, Engage and Neutralize CBRNE Threats
- F2T2 Difficult Targets In Complex Urban and Difficult Terrains
- **Rapidly Deliver Scalable Kinetic & Non-Kinetic Effects to Difficult Targets**
- Deliver On-Demand, Precise Lethal Effects to Difficult Targets
- Engage Adversaries with Non-Lethal Force





FLTC 3.4: Rapidly Deliver Scalable Kinetic and Non-Kinetic Effects to Difficult Targets

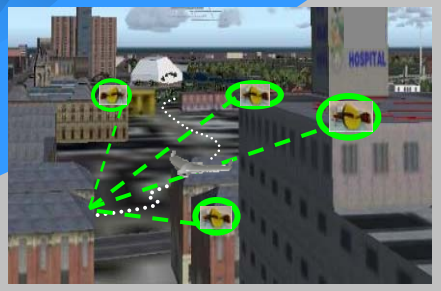
- Search and destroy in an open urban environment with low background complexity
- Point to point connectivity (ISR to munition)
- High confidence ID (>X%) of limited target set (soft mobile) with sparse confusers
- Limited duration (X min)
- Low threat environment
- Line-of-sight to target
- Selectable effects with limited collateral damage (X:1 adversary/innocent CDR)

Near Term (2012)

- Deny enemy operation in multi-story environment (urban canyons)
- Intra-weapon and limited network connectivity
- High confidence ID (>X%) of expanded target set (soft mobile and adversaries) with moderate confusers
- Moderate duration (X hours)
- Medium threat environment
- Partially obscured line-of-sight (X%)
- Dynamic selectable effects with minimum collateral damage (X:1 adversary/innocent CDR)

Mid Term (2019)

- Deny enemy operations in all urban environments
- Fully netcentric layered array (platform/sensor/weapon)
- High confidence ID (>X%) of full target set (inside buildings) in complex urban environment
- Long duration (X days)
- High threat environment
- Unimpeded F2T2 and agile delivery system (non-LOS to target)
- Flexible/scalable, precise effects with limited collateral damage (X:1 adversary/innocent CDR)



Far Term (2025)

FLTC 3.4: Decomposition

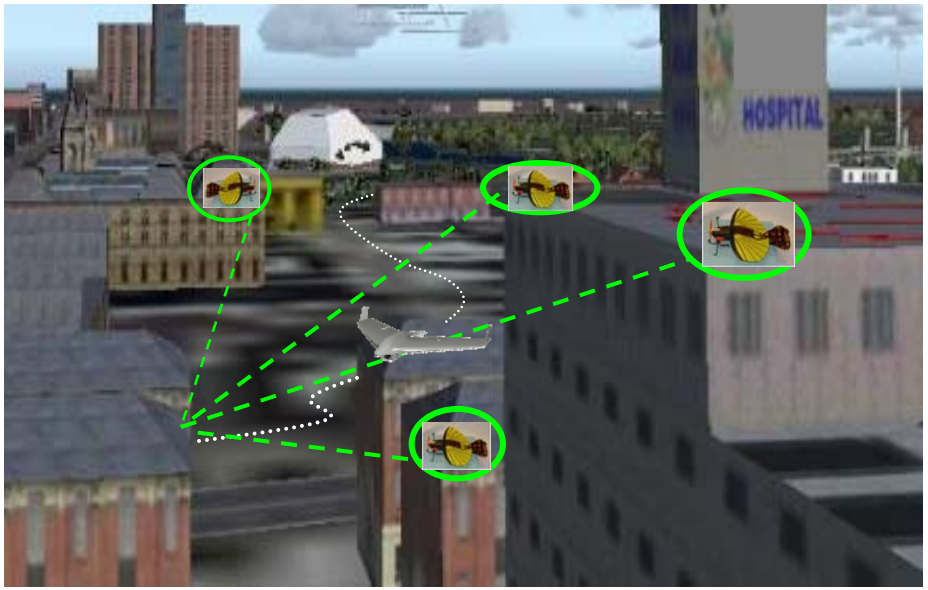
Problem 3.4	Attribute	Products
3.4 Rapidly Deliver Scalable Kinetic and Non-Kinetic Effects to Difficult Targets	3.4.1 Kinetic Lethal Effects Against Difficult Targets	3.4.1.1 ATA/ATR Algorithms (RW)
		3.4.1.2 Autonomous Agile Guidance (RW)
		3.4.1.3 Distributed Agile Engagement Seekers (RW)
		3.4.1.4 Agile Micro-Munition Vehicle (RW)
		3.4.1.5 Adversary Neutralization (RW)
		3.4.1.7 IED Neutralization (RW)
		3.4.1.8 CBRNE Neutralization (RW)
		3.4.1.9 Assessment & Demonstration (RW)

Capability's Products

Other FLTC Products

Taxonomy Breakdown Example

FLTC 3.4.1: Kinetic Lethal Effects Against Difficult Targets



Future Operational Capability Vision

- Smart vehicles/sensors autonomously find and track individuals in urban environment
- Perform reconnaissance inside urban structures without risk to Blue forces
- Deliver selectable effects to adversaries and/or their support activities, inside buildings

Current Capability

- GPS waypoint navigation and control
- Munitions = fixed yield and fuzing
- Unpredictable collateral damage
- ATR/ATA and track of man-made objects in “limited clutter” environment
- Autonomous control of individual platforms
- Large aperture, stand-alone sensors
- Direct human effects delivery / control

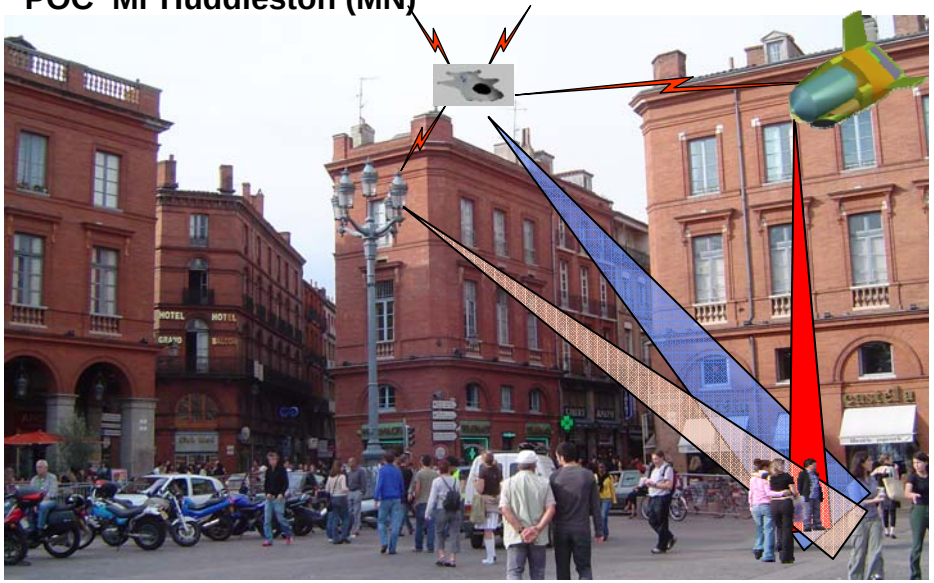
Mid Term Exp/Demo Capability (2015)

Canyon Warrior

- Vision based navigation and control
- Munitions - variable yield & dynamic fuzing
- Near-zero collateral damage
- ATR/ATA and track of humans in urban environments, around structures
- Cooperative control of multiple platforms
- Multiple sensors, very small apertures
- Semi-autonomous operation

FLTC 3.4.1.3 Distributed Agile Engagement Seekers

POC Mr Huddleston (MN)



Far Term Vision

Capability to autonomously locate, ID, and track (adversaries and/or their support activities) in a complex urban environment cooperatively with distributed seeker array

Technology Challenges

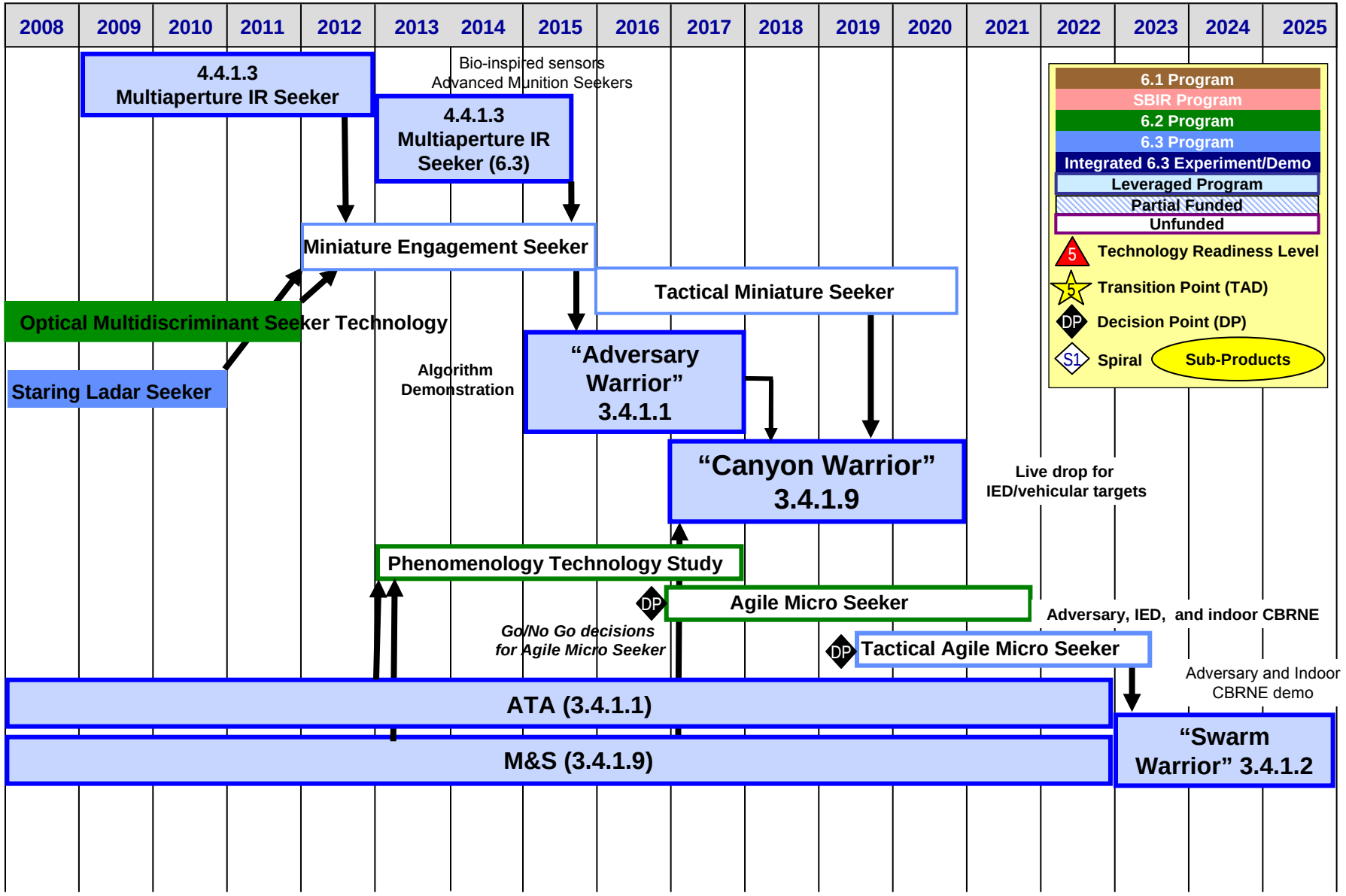
- Miniaturization of sensor components and signal processors
- Development of light-weight multi-spectral radome
- Fusion of data from multiple sensors
- Real-time target detect and track
- Navigation based on seeker inputs or environmental sensing
- Network capable sensor

Mid Term Exp/Demo (2017-2020)

<u>Canyon Warrior</u>

- Demonstrate ability of sensor to autonomously locate and track adversaries and/or their support activities in an urban canyon environment
- Cooperative with distributed sensor array

FLTC 3.4.1.3: Distributed Agile Engagement Seekers



On-Line Access By Industry Partners to FLTC Information

- **Who can have access: Those with a "need to know"**
  - **DoD, DoD Contractors, Federal Agencies and Federal Agency Contractors**
- **Must obtain Software-PKI Certificate before gaining access**
  - **DoD requires PKI Certificate to access Government network**
  - **One certificate required for every person seeking access (tied to person & person's computer)**
  - **Link to ECA vendor with info:**
    - **http://iase.disa.mil/pki/eca**
- **AFRL Required Registration Requirements (Submit 4 Forms)**
  - **DD Form 2875 (one per person seeking access)**
  - **Copy of Company's DD Form 2345 (Contractors Only)**
  - **Justification Letter for access on company letterhead**
  - **Visit Request on company letterhead**
    - **Address Visit Request to AFRL/XPPA, 1864 4th Street, Bldg 15, Room 225, Wright-Patterson AFB, OH 45433-7132**
- **POC: AFRL/XPPA**
  - **afrl.xppa.fltc.office.account@wpafb.af.mil**
  - **(937) 255-5745**
  - **Fax: (937) 656-7321**

Contact Information

Leo J Rose
Chief, FLTC #3
AFRL/RW
Munitions Directorate
Eglin AFB, FL 32542
850-883-2188
ROSEL@EGLIN.AF.MIL